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ABSTRACT

The importance of aqalyzing laboratory situations in a technical school special needs area is increasing rapidly. Such a system is essential for objectively analyzing the content of laboratories and describing the tasks performed there in a standardized and easily understood manner. The laboratory description can be easily used to provide program placement information to advisors of special needs students. It becomes a basic document for special needs staff orientation and student assessment. The laboratory analysis used in this document was based on a job analysis technique developed by the U.S. Department of Labor. This system identifies and describes in a systematic, succinct manner the following components: (1) what the student is required to do in the laboratory in terms of activities or functions; (2) how the laboratory activities are done--the methods, techniques, or processes involved, and the devices used; (3) student characteristics--the skills, knowledge, abilities, and adaptabilities needed to accomplish the laboratory activities; (4) the results of the laboratory activities--the goods produced, services given, and materials used; and (5) the context of the laboratories in terms of environmental factors and the nature of the student's discretion, responsibility, or accountability. The use of this adaptation of job analysis techniques within a vocational technical school's laboratory will allow for increased access, increased quality, and increased success for special needs students in vocational education. (KC)

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INDEX

INTRODUCTION:

PART 1 LAB ANALYSIS REPORT

Form	P. 1,2
Procedure	P. 3,4

PART 2 PHYSICAL DEMANDS

Form	P.1, 2
Procedure	P.3 - 7

PART 3 ENVIRONMENTAL CONDITIONS

Form	P. 1
Procedure	P. 2 - 4

PART 4 RATINGS ESTIMATE SHEET

Form	P. 1	
Procedure	P. 2 - 28	
Student Functions	P. 3 - 6	
Work Fields	P. 7 - 11	
MPSMS	P. 12 - 14	
General Educational Development		P. 15 - 18
Lab Training Time (SVD)		P. 19
Aptitudes		P. 19 - 23
Interests		P. 24 & 25
Temperaments		P. 26 - 28

INTRODUCTION

Job Analysis is the technique used for obtaining and presenting factual job information. This information is the basis for many decisions made each day by industry, government and private agencies, and employee organizations.

In this manual, the job analysis technique developed as a result of the United States Department of Labor project initiated in 1978 by the New York Occupational Analysis Field Center, has been adapted for use in analyzing laboratory situations within a technical school. This system of lab analysis allows the educator to determine the levels of social, motor, communicative and cognitive ability a prospective student needs to be successful in a lab area.

Lab Analysis identifies and describes, in a systematic, comprehensive and succinct manner

- what the student is required to do in the lab in terms of activities or functions;
- how the lab activities are done - the methods, techniques, or processes involved, and the devices used;
- the results of the lab activities - the goods produced, services given, materials used;
- student characteristics - the skills, knowledges, abilities needed to accomplish the lab activities;
- context of the labs in terms of environmental and organizational factors and the nature of the student's discretion, responsibility, or accountability

The source for the lab analysis offered here is:

A Guide to Job Analysis
Division of Occupational Analysis
U.S. Employment Service
Employment and Training Administration
U.S. Department of Labor

printed and distributed by:

Materials Development Center
Stout Vocational Rehabilitation Institute
University of Wisconsin-Stout
March, 1982

LAB ANALYSIS REPORT

1. Lab Title: _____

2. Job Level Titles: _____

3. Number of Students Accommodated: _____

4. Job Summary: _____

5. Description of Lab Tasks: _____

6. Work Devices: _____

7. Materials, Products, Subject Matter, and Services: _____

LAB ANALYSIS REPORT

1. Lab Title: _____

8. Definition of Terms: _____

_____

_____

_____

_____

9. Years of Schooling: _____

10. Job Training Time

	Length		
	Usual	Alter.	Alter.
a. High School Courses			
b. Vocational Courses			
c. Apprenticeship			
d. In plant Training			
e. Performance on Related Jobs			
Total JTT			

f. Other training or experience: _____

_____

11. Licenses, etc: _____

_____

12. General Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

LAB ANALYSIS REPORT

Each Lab Analysis Report is an individual study. It serves a dual purpose as the basic tool for structuring the analysis of lab activities and as a record of the results of the analysis. The report form presented here is adapted from one designed by the U.S. Employment Services Division of Occupational Analysis to gather data for the Dictionary of Occupational Titles.

Procedure:

1. Lab Title: Enter the common established lab title as found in the course catalogue.

2. Job Level Titles: Record all job titles of training offered within the lab. Enter the most commonly used title first; if the title is nondescriptive, enter a meaningful, descriptive title after it in parenthesis. Other job titles should follow, separated by semi-colons. (e.g., File Clerk; document clerk)

3. Number of Students Accommodated: Enter the total number of students accomodated within the lab.

4. Job Summary: Enter a brief but comprehensive statement that describes the overall purpose and nature of the lab. The Job Summary should reflect the predominant Worker Functions, Work Fields, and Materials, Products, Subject Matter, Services (MPSMS) entered on the Ratings Estimate Sheet. The job summary should be limited to one sentence.

5. Description of Lab Tasks: Describe the tasks performed in the Lab. Each task may be described in a flag statement (a short summary of a task that consists of a verb/verbs and its object/objects; serves to orient the reader to the scope and content of the task by stating in general terms what the student does in the lab.).

6. Work Devices: List all work devices used by the student within the lab. Include the size, weight, or other identifying information, such as whether floor or bench mounted, etc. Describe any devices that are unusual or special.

7. Materials, Products, Subject Matter, and Services: List the materials and/or finished products with which the student is involved. Define or describe any material or product that is not commonly known or has a unique application. For tasks/jobs reflecting a subject matter or service, record a brief description of the subject matter or service.

8. Definition of Terms: Define each term listed in #4, "Job Summary" and #5, "Description of Lab Tasks". For easy identification, each term should be underlined as it is introduced in #4 and 5.

9. Years of Schooling: Enter the minimum number of years of schooling that are usually required for placement on the job within the scope of this lab training area. If there are no specific educational requirements, enter "no specific educational requirements".

LAB ANALYSIS REPORT

Procedure:

10. Job Training Time: Enter in the first vertical column of boxes marked "Usual", the estimated length/lengths of one or more of the lab/training requirements reflecting the most typical/common way by which students train for the job level listed in #2. Express estimates in days, weeks, or months, "d", "w", or "m". If there are alternate ways by which students train for the job, enter lengths of those training requirements in appropriate boxes of the columns marked "Alter".

    If two training requirements are concurrent, enter "Concurrent with" in parentheses on the line to the left of the estimate for the first requirement, and indicate the letter designation of the second requirement.

11. Licenses, etc.: List licenses, certification, or other registry needed to indicate attainment of a recognized level of competence and/or which meet Federal, State, or local requirements.

12. General Comments: Record any necessary comments or explanations concerning the Lab Analysis Report items.

PHYSICAL DEMANDS WITHIN LAB

Lab Title: _____

Degree of Strenuousness S L M H VH

FACTORS	N.P.	Present O	F	C	COMMENTS
1. Standing					
2. Walking					
3. Sitting					
4. Reclining					
5. Lifting					
6. Carrying					
7. Pushing					
8. Pulling					
9. Climbing					
10. Balancing					
11. Stooping					
12. Kneeling					
13. Crouching					
14. Crawling					
15. Reaching					
16. Handling					
17. Fingering					
18. Feeling					
19. Talking					
20. Hearing					
21. Tasting/Smelling					
22. Near Vision					
23. Midrange Vision					
24. Far Vision					

PHYSICAL DEMANDS WITHIN LAB

Lab Title: _____

Degree of Strenousness S L M H VH

FACTORS	N.P.	Present O	Present F	Present C	COMMENTS
25. Depth Perception					
26. Visual Accommodation					
27. Color Vision					
28. Field of Vision					

PHYSICAL DEMANDS

The Physical Demands component is extremely useful for the counseling and placement of students in lab areas. This method involves describing and evaluating the physical-demands requirements of a lab as that lab exists at the time of the analysis to permit the matching of students having the necessary capabilities.

The following are the five Degrees of Strenuousness Ratings and the 28 Physical Demands factors used by the U.S. Employment Service.

Procedures

Degree of Strenuousness: Circle the symbol S, L, M, H, or VH to indicate the degree of strenuousness estimated for lab activities. The definitions for the strength factors are on pages 3, 4, 5, 6, 7,

Factors: Enter an "X" in the appropriate column opposite each factor to indicate whether the activity is not present (NP), or present occasionally (O), frequently (F), or constantly (C). See page 4, Part 2 for definitions of factors and frequency symbols. Circle the number designations of those factors rated important, based on the criteria found on page 4, Part 2.

PHYSICAL DEMANDS WITHIN LAB

Definitions:

S - Sedentary	- lifting 10 pounds maximum, occasionally lifting or carrying articles; - involves sitting, certain amount of walking and standing required occasionally.
L - Light	- lifting 20 pounds maximum and/or frequently lifting or carrying objects weighing up to 10 pounds; - requires walking or standing to a significant degree; or - requires sitting most of the time but entails pushing and pulling of arm or leg controls.
M - Medium	- lifting 50 pounds maximum; - frequently lifting or carrying objects weighing up to 25 pounds.
H - Heavy	- lifting 100 pounds maximum; - frequently lifting objects weighing up to 50 pounds.
VH - Very Heavy	- lifting objects in excess of 100 pounds; - frequently lifting or carrying objects weighing 50 pounds or more.

FREQUENCY OF FACTORS

NP	-	Not Present
O	-	Occasional - under 20 percent of the time
F	-	Frequent - between 20 percent and 80 percent
C	-	Constant - over 80 percent of the time

IMPORTANCE OF EACH PHYSICAL DEMAND

Rate a factor "Important" if it meets at least one of the following criteria:

- It is essential to the successful performance of one or more major or critical tasks within the lab.
- It is of an intense, precise, or continuous nature.
- It affects the safety of the students or others.

PHYSICAL DEMANDS WITHIN LAB

Definitions	PHYSICAL DEMANDS FACTORS
1. Standing	- remaining on one's feet in an upright position at a work station without moving about (describe in terms of duration)
2. Walking	- moving about on foot, includes running (describe in terms of duration, distance)
3. Sitting	- remaining in the normal seated position (describe in terms of duration)
4. Reclining	- lying on one's side or in a prone or supine position (describe in terms of position and duration)
5. Lifting	- raising or lowering an object from one level to another, using hands, arms, and/or shoulders. Includes upward pulling. (describe in terms of weight and vertical distances)
6. Carrying	- moving an object by hand, arms, or on shoulders (describe in terms of weight, distance, and duration)

PHYSICAL DEMANDS WITHIN LAB

Definitions

PHYSICAL DEMANDS FACTORS

7. Pushing - exerting force upon an object so that the object moves away from the force; includes slapping, striking, kicking and treadle actions.
(describe in terms of weights, estimated force, distance, duration, and/or type of surface)

8. Pulling - exerting force upon an object so that the object moves toward the force; includes jerking.
(describe in terms of weights, estimated force, distances, duration, and/or type of surface)

9. Climbing - ascending or descending ladders, stairs, scaffolding, ramps, poles, etc., using feet and legs and/or hands and arms
(describe in terms of height, steepness, duration, and type of structure climbed)

10. Balancing - maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces
(describe in terms of type or condition of surface and activities)

11. Stooping - bending body downward and forward by bending spine at the waist
(describe in terms of duration)

12. Kneeling - bending legs at knees to come to rest on knee or knees
(describe in terms of duration)

13. Crouching - bending body downward and forward by bending legs and spine
(describe in terms of duration)

14. Crawling - moving about on hands and knees or hands and feet
(describe in terms of distance and duration)

15. Reaching - extending hand/hands and arm/arms in any direction

PHYSICAL DEMANDS WITHIN LAB

Definitions

PHYSICAL DEMANDS FACTORS

16. Handling - seizing, holding, grasping, turning, or otherwise working with hand/hands; fingers are involved only to the extent that they are an extension of the hand, such as to turn a switch or shift automobile gears.

17. Fingering - picking, pinching, or otherwise working primarily with fingers rather than with the whole hand or arm as in handling.

18. Feeling - perceiving attributes of objects, such as size, shape, temperature, or texture, by touching with skin, particularly that of fingertips

19. Talking - expressing or exchanging ideas by means of the spoken word

20. Hearing - perceiving the nature of sounds

21. Tasting/ Smelling - distinguishing, with a degree of accuracy, differences or similarities in intensity or quality of flavors and/or odors, or recognizing particular flavors and/or odors, using tongue and/or nose

22. Near Vision - clarity of vision at 20 inches or less

23. Midrange Vision - clarity of vision at distances of more than 20 inches and less than 20 feet

24. Far Vision - clarity of vision at 20 feet or more

25. Depth Perception - three-dimensional vision; ability to judge distances and spatial relationships so as to see objects where and as they really are

26. Visual Accommodation - adjustment of lens of eye to bring an object in to sharp focus

27. Color Vision - ability to identify and distinguish colors

28. Field of Vision - observing an area that can be seen up and down or to right or left while eyes are fixed on a given point

ENVIRONMENTAL CONDITIONS

Lab Title: _____

CONDITIONS	N.P.	Present Under 20%		Present 20%/Over		COMMENTS
		Not Haz.	Haz.	Not Haz.	Haz.	
1. Exposure to weather						
2. Extreme cold						
3. Extreme heat						
4. Wet and/or humid						
5. Noise						
6. Vibration						
7. Atmospheric conditions						
INHERENT HAZARDS						
8. Moving mechanical parts						
9. Electric shock						
10. High, exposed places						
11. Radiant energy						
12. Explosives						
13. Toxic or caustic chemicals						
14. Other:						

PROTECTIVE CLOTHING AND DEVICES

ENVIRONMENTAL CONDITIONS

Environmental Conditions are the specific physical conditions to which the student would be exposed while performing assigned tasks.

Procedures

Rating Environmental Conditions: Carefully read the definitions of the conditions on pages 3 and 4. Rate any of the conditions present within the lab if either of the following two criteria are met:

- The student is exposed to the factor an estimated 20 percent or more of the time.
- The factor is hazardous, in that it may cause bodily injury or danger to life and health.

Conditions 8 - 14, Inherant Hazards, include those conditions which are usually considered to be hazardous. When a hazard has been overcome through use of safety equipment over which the student has no control, the condition is not rated as hazardous.

ENVIRONMENTAL CONDITIONS WITHIN LAB

Definitions

ENVIRONMENTAL CONDITION FACTORS

The following are the 14 Environmental Conditions rated by the U.S. Employment Service:

1. Exposure to weather - exposure to hot, cold, humid, or windy conditions caused by the weather, which results in marked bodily discomfort.

2. Extreme cold - exposure to nonweather - related temperatures that are sufficiently low to cause marked bodily discomfort.

3. Extreme heat - exposure to nonweather - related temperatures that are sufficiently high to cause marked bodily discomfort.

4. Wet and/or Humid - contact with water or other liquids; or exposure to nonweather-related humid conditions where humidity is sufficiently high to cause marked bodily discomfort.

5. Noise - exposure to constant or intermittent sounds of a pitch or level sufficient to cause a worker to have difficulty hearing the voice of a person three or four feet away unless voice is raised above normal conversational level. Noise is considered to be hazardous if level and exposure time are sufficient to cause possible hearing loss without protection.

6. Vibrations - exposure to a shaking object or surface that causes a strain on the body or extremities.

7. Atmospheric conditions - exposure to conditions that affect the respiratory system or the skin, such as fumes, noxious odors, dusts, mists, gases, and poor ventilation.

Inherent Hazards - exposure to conditions which may cause bodily injury or danger to life or health, such as:

8. Proximity to Moving, Mechanical Parts

9. Exposure to Electrical Shock

ENVIRONMENTAL CONDITIONS WITHIN LAB

Definitions

ENVIRONMENTAL CONDITION FACTORS

10. Working in High, Exposed Places
11. Exposure to Radiant Energy
12. Working with Explosives
13. Exposure to Toxic or Caustic Chemicals
14. Other Hazards Not Listed Elsewhere

RATINGS ESTIMATE SHEET

Lab Title: _____

1. Work Performed Estimates:

   a. Student Functions Data _____ People _____ Things _____

   b. Work Fields _____

   _____

   c. MPSMS _____
   (Materials, Products, Subject Matter, Services)

   _____

   _____

2. Student Characteristic Estimates:

   a. General Educational Development

   Reasoning _____ Math _____ Language _____

   b. Lab Training Time _____ D W M (SVP _____)

   c. Aptitudes Level

G	V	N	S	P	Q	K	F	M	E	C

   d. Interests 01 02 03 04 05 06 07 08 09 10 11 12

   e. Temperaments D R I V E A S T U P J

   _____

   _____

Lab Analyst _____

Date _____

RATINGS ESTIMATE SHEET

PROCEDURES FOR PREPARING THE RATINGS ESTIMATE SHEET

1. Work Performed Estimates

   a. Student Functions: Select the Data, People and Things that best characterize the lab as a whole, and enter the appropriate code in each space provided. Circle the captions, Data, People, and/or Things to indicate which one/ones best exemplify the lab. Student functions are discussed on pages 3, 4, 5 and 6 of Part 4.

   b. Work Fields: Enter the code and title of up to three Work Fields that reflect the major objective/objectives of the lab. List in order of importance and separate by semicolons. Work Fields are classified and defined on pages 7, 8, 9, 10 and 11 of Part 4.

   c. MPSMS: (Materials, Products, Subject Matter, Services): Enter the code and title of up to three MPSMS classifications, pages 12, 13 and 14, Part 4, that reflect the major areas of student involvement. List in order of importance and separate by semicolons.

2. Student Characteristics Estimates: These estimates are expressed in terms of lab characteristics or student preferences, not qualifications. It is important that all estimates consistently reflect this orientation.

   a. General Educational Development: Enter in the spaces provided for Reasoning, Math and Language, the numbers corresponding to the levels whose definitions best describe the levels of reasoning, mathematical, and language development, as estimated by the lab analyst. (Pages 15, 16, 17 and 18, Part 4.

   b. Lab Training Time and Specific Vocational Preparation: Enter the total estimated length of Lab Training Time (LTT) and circle "D", "W", or "M" to indicate whether the total is in "days", "weeks", or "months". See page 19 of Part 4.

   c. Aptitudes: Enter a number, one through five, in the box immediately below each aptitude letter to indicate the estimated aptitude level required in the lab. If it is determined that an aptitude is not present at all, mark an "X" in the appropriate box rather than recording one of the aptitude levels. Aptitudes are discussed and defined on pages 19, 20, 21, 22 and 23 of Part 4.

   d. Interests: Circle the numbers of up to three interest factors that apply to the lab as a whole or to an important aspect of the lab. The interest factors are discussed and defined on pages 24 and 25 of Part 4.

   e. Temperaments: Circle the letter designations of one or more temperament factors considered to be important in relation to the kinds of adjustments which the student must make for successful lab performance. See pages 26, 27 and 28 of Part 4 for an explanation of temperaments and definitions of the temperament factors.

RATINGS ESTIMATE SHEET

STUDENT FUNCTIONS

Student functions are activities which identify students' lab relationships to data, people, and things. These relationships are expressed by the following twenty-four Worker Function factors used by the United States Employment Service.

0 Synthesizing	0 Mentoring	0 Setting Up
1 Coordinating	1 Negotiating	1 Precision Working
2 Analyzing	2 Instructing	2 Operating-Controlling
3 Compiling	3 Supervising	3 Driving-Operating
4 Computing	4 Diverting	4 Manipulating
5 Copying	5 Persuading	5 Tending
6 Comparing	6 Speaking-Signaling	6 Feeding-Offbearing
	7 Serving	7 Handling
	8 Taking Instructions-Helping	

Each worker function depicts a broad action which summarizes what a student does in the lab in relation to data, people and things.

RATINGS ESTIMATE SHEET

Definitions

STUDENT FUNCTIONS

Although the arrangement of the student functions within each of the three categories is structured to suggest an upward progression from the less complex to the more complex functions, there are numerous instances where hierarchical relationships among them are limited, imprecise, reversed, or nonexistent. Because of this, the prime value of student functions in the lab is to reflect the nature of the student's data, people, and things relationships, not to indicate job complexity.

Data — Information, knowledge, and conceptions, related to data, people or things, obtained by observation, investigation, interpretation, visualization and mental creation. Data are intangible and include numbers, words, symbols, ideas, concepts, and oral verbalizations.

0 Synthesizing: Integrating analyses of data to discover facts and/or develop knowledge concepts of interpretations.

1 Coordinating: Determining time, place and/or sequence of operations or actions on the basis of analysis of data and implementing decisions.

2 Analyzing: Examining and evaluating data.

3 Compiling: Gathering, collating, or classifying information about data, people or things.

4 Computing: Performing arithmetic operations and reporting on and/or carrying out a prescribed action in relation to them.

5 Copying: Transcribing, entering, or posting data by hand or keyboard-type machine.

6 Comparing: Distinguishing the readily observable functional, structural, or compositional characteristics of data, people or things.

People — Human beings; also animals dealt with on an individual basis as if they were human.

0 Mentoring: Dealing with individuals in terms of their total personality in order to advise, counsel, and/or guide them with regard to problems that may be resolved by legal, scientific, clinical, spiritual, and/or other professional principles.

RATINGS ESTIMATE SHEET

Definitions

STUDENT FUNCTIONS

People

1 Negotiating: Exchanging ideas, information, and opinions with others to formulate policies and programs and/or arrive jointly at decisions.

2 Instructing: Teaching subject matter to others,or training others through explanation, demonstration, and supervised practice.

3 Supervising: Determining or interpreting work procedures for a group of workers.

4 Diverting: Amusing others, usually through the medium of stage, screen, television, or radio.

5 Persuading: Influencing others in favor of a product, service, or point of view, directly or by telecommunications.

6 Speaking -Signaling: Talking with and/or signaling people to convey or exchange information.

7 Serving: Attending to the needs or requests of people or animals.

8 Taking Instructions-Helping: Receiving and acting upon the instructions or orders of another individual.

Things Inanimate objects as distinguished from human beings.

0 Setting Up: Adjusting machines or equipment by replacing or altering tools, jigs, fixtures, and attachments to prepare them to perform their functions, change their performance, or restore their proper functioning if they break down.

1 Precision Working: Using body members and/or tools or work aids to work, move, guide, or place objects or materials in situations where ultimate responsibility for the attainment of standards occurs and selection of appropriate tools, objects, or materials, and the adjustment of the tool to the task. Requires exercise of considerable judgment.

2 Operating-Controlling: Starting, stopping, controlling, and adjusting the progress of a machine or equipment.

3 Driving-Operating: Starting, stopping, and controlling the actions of machines or equipment for which a course must be steered or guided, in order to fabricate, process, and/or move things or people.

RATINGS ESTIMATE SHEET

Definitions

STUDENT FUNCTIONS

Things

4 Manipulating: Using body members, tools, or special devices to work, move, guide, or place objects or materials.

5 Tending: Starting, stopping, and observing the functioning of machines and equipment.

6 Feeding-Offbearing: Inserting, throwing, dumping, or placing materials in or removing them from machines or equipment which are automatic or tended or operated by other workers.

7 Handling: Using body members, handtools, and/or special devices to work, move, or carry objects or materials.

RATINGS ESTIMATE SHEET

WORK FIELDS

Work fields are categories of technologies that reflect how work gets done and what gets done as a result of the work activities of the job. There are 94 work fields identified for use by the United States Employment Service for classification of all jobs in the economy in terms of what gets done on the job.

Procedure

Select one or more of the work fields that most adequately encompass what is done in the lab. Work fields should not be assigned on the basis of minor activities, such as incidental material moving or recordkeeping.

RATINGS ESTIMATE SHEET

WORK FIELDS ORGANIZATION

The work fields have been organized into the following groups on the basis of similar technologies. This arrangement may be helpful in insuring the applicability of the work field/fields selected for the lab being analyzed.

	Organization	Description
001 002 003 004	Hunting - Fishing Animal Propagating Plant Cultivating Mining-Quarrying-Earth Boring	Securing, producing, and cultivating raw materials, products, and animals on and below the surface of the earth; usually outdoor work.
007	Excavating-Clearing-Foundation Building	Grading surfaces and building foundations.
011 013 014	Material Moving Transporting Pumping	Moving materials and people by hand and machine power.
021	Stationary Engineering	Producing and distributing heat, power, and conditioned air.
031	Cleaning	Industrial, commercial, and domestic cleaning.
032	Surface Finishing	Shaping, pressing, and stretching articles, usually with heat and steam, under tension or pressure.
033	Lubricating	Coating objects with liquid and dry lubricants.
034	Butchering-Meat Cutting	Slaughtering livestock and preparing meats for marketing.
041	Filling-Packing-Wrapping	Packaging materials and products for distribution and storage.
051 052 053 054 055 056 057	Abrading Chipping Boring Shearing-Shaving Milling-Turning-Planing Sawing Machining	Working with machines and handtools to cut and shape materials and objects usually made from wood, metal, and plastics. Can also involve assembly of objects.

RATINGS ESTIMATE SHEET

WORK FIELDS ORGANIZATION

Organization		Description
061	Fitting-Folding	Folding and assembling parts and materials, usually light, by means of fitting together or joining with sticky compounds and fastening devices.
062	Fastening	
063	Fluing-Laminating	
071	Bolting-Screwing	Assembling parts and materials, usually of metal, wood and plastics, by means of screws, nails, and rivets.
072	Nailing	
073	Riveting	
081	Welding	Bonding and cutting materials by means of a gas flame, electric arc, laser beam, combination welding process, and soldering.
082	Flame Cutting-Arc Cutting-Beam Cutting	
083	Soldering-Brazing	
091	Masoning	Building and repairing structures and surfaces, and assembling structural parts, usually working with brick, cement, mortar, stone, and other building materials.
092	Laying-Covering	
094	Calking	
095	Paving	
102	Structural Fabricating-Installing-Repairing	All-round fabricating, installing, and repairing of structures and electrical, electronic, and mechanical units.
111	Electrical-Electronic Fabricating-Installing-Repairing	
121	Mechanical Fabricating-Installing-Repairing	
131	Melting	Compounding, melting, heat conditioning, and shaping objects, usually metal and plastics, by methods which frequently involve heat.
132	Casting	
133	Heat Conditioning	
134	Pressing-Forging	
135	Die Sizing	
136	Molding	
141	Baking-Drying	Processing various materials, in solid, fluid, semi-fluid, and gaseous states, during production process.
142	Crushing-Grinding	
143	Mixing	
144	Distilling	
145	Separating	
146	Cooking-Food Preparing	
147	Processing-Compounding	
151	Immersing-Coating	Coating and impregnating materials and products to impart decorative and protective finish and other specific qualities.
152	Saturating	
153	Brushing-Spraying	
154	Electroplating	

RATINGS ESTIMATE SHEET

WORK FIELDS ORGANIZATION

	Organization	Description
161	Combing-Napping	Converting fiber raw stock into yarn and thread, and interlacing and otherwise working yarns to form woven, nonwoven,, knitted and tufted fabrics.
162	Spinning	
163	Winding	
164	Weaving	
165	Knitting	
166	Tufting	
171	Sewing-Tailoring	Joining, mending and fastening materials and products, usually with needle and thread, and fitting and adjusting parts.
182	Etching	Cutting designs and letters into materials and products by sandblasting, applying acids, and action of sharp pointed tools.
183	Engraving	
191	Printing	Transferring letters and designs onto paper and other material, by use of ink and pressure, includes setting type and preparing plates.
192	Imprinting	
201	Photographing	Taking pictures and processing film.
202	Developing-Printing	
211	Appraising	Evaluating and estimating the quality, quantity, and value of things and data; ascertaining the physical characteristics of materials and objects.
212	Inspecting-Measuring-Testing	
221	Stock Checking	Receiving, storing, issuing, shipping, requisitioning, and accounting for stores of materials.
231	Verbal Recording-Recordkeeping	Preparing and maintaining verbal and numerical records.
232	Numerical Recording-Recordkeeping	
233	Data Processing	
241	Laying Out	Plotting, tracing, and drawing diagrams and other directive graphic information for use in design and production; designing and construction machinery, structures, and systems.
242	Drafting	
243	Surveying	
244	Engineering	
251*	Researching	Controlled exploration of fundamental areas of knowledge, by means of critical and exhaustive investigation and experimentation.

RATINGS ESTIMATE SHEET

WORK FIELDS ORGANIZATION

261	Writing	Creative work
262	Artistic Painting-Drawing	
263	Composing-Choreographing	
264	Styling	
271	Investigating	Dealing with people to gather information to carry out business and legal procedures.
272	Litigating	
281	System Communicating	Providing and effecting the transmission of information to other persons, indirectly-by electrical or electronic media-and directly-by voice or written statement.
282	Information Giving	
291	Accommodating	Dealing with people to provide services of various types.
292	Merchandising-Sales	
293	Protecting	
294	Health Caring-Medical	
295	Administering	
296	Teaching	
297	Entertaining	
298	Advising-Counseling	

RATINGS ESTIMATE SHEET

MATERIALS, PRODUCTS, SUBJECT MATTER, AND SERVICES

MPSMS

This work performed in lab component includes:

- basic materials being processed, such as fabric, metal or wood;
- final products being made, cultivated, harvested, or captured, such as wild animals, sponges, field crops, trees and automobiles;
- data or subject matter being dealt with or applied, such as astronomy or journalism;
- services being rendered, such as barbering or janitorial.

The MPSMS component is organized into 48 groups with most groups divided into as many as 9 categories, totaling 328 categories.

The MPSMS classification for a given lab is generally based on the overall purpose of the lab, reflected by the skill required of the student. In production labs, the MPSMS classification can be a final product.

(MPSMS categories are closely related in organization and content to categories in the Standard Industrial Classification Manual (Washington: Executive Office of the President, Bureau of the Budget, 1972) and to educational classifications of subject matter fields.)

RATINGS ESTIMATE SHEET

MATERIALS, PRODUCTS, SUBJECT MATTER, AND SERVICES

M, P, SM, P

ORGANIZATION OF MPSMS GROUPS

Materials and Products

300 Plant Farm Crops
310 Horticultural Specialties, Forest Trees, Products
320 Animals
330 Marine Life
340 Raw Fuels and Nonmetallic Minerals

350 Raw Metallic Minerals
360 Structures
370 Ordnance
380 Food Staples and Related
390 Food Specialties

400 Tobacco Products
410 Textile Fibers and Related
420 Fabrics and Related
430 Textile Products
440 Apparel

450 Lumber and Wood Products
460 Furniture and Fixtures
470 Paper and Allied Products
480 Printed and Published Products
490 Chemical and Allied Products

500 Petroleum and Related Products
510 Rubber and Plastic Products
520 Leather and Leather Products
530 Stone, Clay and Glass Products
540 Metal, Ferrous, Nonferrous

550 Fabricated Metal Products, except Ordnance, Machinery, and Transportation Equipment
560 Machinery and Equipment, except Electrical
&570
580 Electrical and Electronic Machinery, Equipment, Supplies
590 Transportation Equipment

600 Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches, Clocks
610 Miscellaneous Fabricated Products

RATINGS ESTIMATE SHEET

MATERIALS, PRODUCTS, SUBJECT MATTER, AND SERVICES

M, P, SM, P

ORGANIZATION OF MPSMS GROUPS

Subject Matter

700, 710 Architecture and Engineering
720 Mathematics and Physical Sciences
730 Life Sciences
740 Social Sciences
750 Arts and Literature

Services

850 Transportation Services
860 Communication Services
870 Electric, Gas, and Sanitation Services
880 Merchandising Services
890 General Business, Finance, Insurance, Real Estate Services

900 Domestic, Building, and Personal Services
910 Amusement and Recreation Services
920 Medical and other Health Services
930 Educational, Legal, Museum, Library, Archival Services
940 Social, Employment, Spiritual Services

950 Government and Related Services
960 Miscellaneous Services

RATINGS ESTIMATE SHEET

REASONING, MATHEMATICAL AND LANGUAGE DEVELOPMENT

GENERAL EDUCATIONAL DEVELOPMENT

Education of a general nature contributes to the reasoning development and the acquisition of mathematical and language skills that are required of the student to achieve average satisfactory lab performance.

Reasoning development, mathematic development and language development are presented as three distinct scales. There is no attempt here made to equate the numbered levels nor the ratings from each scale. Each is considered, regarded, and used independently.

Procedures

Review the three scales and select one level from each whose definition best matches the level of reasoning, mathematical and language development required of the student, based on the activities within the lab. Record the number of each level to indicate "R", "M", and "L" ratings.

DEVELOPMENTAL LEVELS: REASONING, MATHEMATICAL, LANGUAGE

	REASONING	MATHEMATICAL	LANGUAGE
1.	- apply common sense understanding to carry out one or two step instructions; - carry out standardized situations with occasional or no variables in or no variables in or from these variables within the lab.	- perform simple addition, subtraction, reading, copying of numbers, counting and recording; - perform operations within measurement units; inch, foot, yard; ounce, pound; cup, pint, quart.	Comprehend and express: - learn lab duties from oral instructions and demonstration; - request orally or in writing supplies to complete tasks; - write identifying information name, address, weights, number, type of product, etc.
2.	- apply common sense understanding to carry out detailed but uninvolved written or oral instructions. - deal with problems involving a few concrete variables in or from standardized situations.	- use arithmetic to add, subtract, multiply, and divide whole numbers.	Comprehend and express: - file, post, mail materials such as forms, checks, bills, receipts; - copy data from one record to another, fill in report forms, and type all work from rough draft or corrected copy; - interview others to be used as data for surveys; - guide people on tours through historical or public buildings.

DEVELOPMENTAL LEVELS: REASONING, MATHEMATICAL, LANGUAGE

	REASONING	MATHEMATICAL	LANGUAGE
3.	-apply common sense understanding to carry out instructions furnished in written, oral or diagrammatic form; - deal with problems involving several concrete variables in or from standardized variables.	- make arithmetic calculations involving fractions, decimals and percentages.	Comprehend and express: - transcribe dictation; make appointments; and handle personal mail; interview and screen people wishing to speak to executives; write routine correspondence
4.	- apply technical principles to solve practical problems and deal with a variety of concrete variables in situations where limited standization exists; - interpret a variety of instructions furnished in oral, written, diagrammatic, or schedule form.	- perform arithmetic, algebraic, and geometric procedures in standard, practical applications, such as shop math and accounting.	- interview job applicants to determine work best suited for their abilities and experience; contact employers to interest them in services of agency. - interpret technical manuals as well as drawings and specifications, such as layouts, blueprints, and schematics.

DEVELOPMENTAL LEVELS: REASONING, MATHEMATICAL, LANGUAGE

REASONING	MATHEMATICAL	LANGUAGE
5. - apply principles of logical or scientific thinking to define problems, collect data, establish facts and draw valid conclusions; - interpret a variety of technical instructions, in books, manuals, mathematical or diagrammatic form; - deal with several abstract and concrete variables.		Comprehend and express: - report, write or edit articles for publications; - prepare and deliver lectures; - interview, counsel or advise others; - evaluate technical data to design specifics.
6. - apply principles of logical or scientific thinking to a wide range of intellectual and practical problems; - deal with non-verbal symbolism; - deal with a variety of abstract and concrete variables; - comprehend the most abstruse classes of concepts.	- apply knowledge of advanced and statistical techniques; - work with a variety of theoretical mathematical concepts; - make original applications of mathematical procedures.	

RATINGS ESTIMATE SHEET

LAB TRAINING TIME

Lab Training Time is the usual time spent by the average student in acquiring information, learning the techniques, and developing the facility for acceptable performance in a lab. Lab training time is expressed in terms of days, weeks, and/or months and is also given a Specific Vocational Preparation rating.

SPECIFIC VOCATIONAL PREPARATION

For reporting purposes, the Lab Training Time estimate is converted to a level of Specific Vocational Preparation based on the following:

Level	Time
1	Short Demonstration only
2	Anytime beyond short demonstration up to 30 days
3	Over 30 days, including 3 months
4	Over 3 months, including 6 months
5	Over 6 months, including 1 year
6	Over 1 year, including 2 years
7	Over 2 years, including 4 years
8	Over 4 years, including 10 years
9	Over 10 years

APTITUDES

Aptitudes are the specific abilities required of a student to perform a given lab activity.

ESTIMATING THE APTITUDE REQUIREMENTS OF A LAB

Every aptitude factor must be considered independently in the rating process for each lab. Estimate the level of each aptitude required of the student for average, satisfactory performance, based on a careful evaluation of the lab activities and the specific student abilities which can be identified in terms of the aptitudes. Then the appropriate aptitude level number is assigned.

If the aptitude is found to be not needed, an "X" is used, rather than a level number.

Aptitude levels are determined by comparing the tasks of the lab with aptitude definitions, considerations and interpretive information. If there is a doubt as to which of two levels should be assigned, select the lower level.

After estimating the level of each aptitude, estimate which of the aptitudes are more important in the lab. Important aptitudes are those without which the main purpose of the lab cannot be accomplished and which are consequently required for successful lab performance. An aptitude is not rated "important" if it is present only in an incidental, insignificant, or occasional task. There will likely be from three to six important aptitudes in every lab.

RATINGS ESTIMATE SHEET

LEVELS OF APTITUDES

Aptitude estimates are useful as analytical and descriptive tools and can be expressed in terms of levels which reflect the amount of the aptitudes needed within the lab.

1. The top 10 percent - an extremely high degree of the aptitude.
2. The highest third exclusive of the top 10 percent - an above average of high degree of the aptitude is necessary.
3. The middle third - a medium degree of the aptitude, ranging from slightly below to slightly above average is needed.
4. The lowest third exclusive of the bottom 10 percent - a below average or low degree of the aptitude is necessary.
5. The lowest 10 percent - a negligible degree of the aptitude is needed.

APTITUDE LEVELS 1 THROUGH 5

1	2	3	4	5
Extremely High Aptitude Needed	High Degree of Aptitude Needed	Medium Degree of Aptitude Needed	Lower Degree of Aptitude Needed	Markedly Low Aptitude Needed
10%	23%	33%	23%	10%

RATINGS ESTIMATE SHEET

Definitions

APTITUDES

	Definitions of Aptitudes	Interpretive Information
G	General Learning Ability: the ability to understand instructions and underlying principles; the ability to reason and make judgments.	Consider: Work requiring the ability to define problems, collect information, establish facts, draw valid conclusions; using logic or scientific thinking to solve a variety of problems; using measurable and varifiable information for making decisions or judgments; understanding detailed work procedures; planning, organizing, coordinating, and directing own work and that of others; copying with a variety of duties; following written or oral instructions; or selecting appropriate work aids and materials to perform a set of tasks.
V	Verbal Aptitude: the ability to understand meaning of words and to use them effectively: the ability to comprehend language, to understand relationships between words, and to understand meanings of whole sentences and paragraphs.	Consider: reading comprehension required to: use or understand oral or written instructions or specifications, texts used in training, and reference materials used in lab for mastery of required technical terminology.
N	Numerical Aptitude: the ability to perform arithmetic operations quickly and accurately.	Consider: Work examples such as making change, keeping of time or production records; using math or geometry to lay out patterns; making or checking numerical entries; complexity of numerical operations as well as speed required and volume of arithmetic activity.

RATINGS ESTIMATE SHEET

Definitions

APTITUDES

	Definitions of Aptitudes	Interpretive Information
S	Spatial Aptitude: the ability to think visually of geometric forms and to comprehend a two-dimensional representation of three-dimensional objects; the ability to recognize the relationships resulting from the movement of objects in space.	Consider: work examples of laying out, positioning, aligning objects; observing movements of objects and comprehending how the movements affect their spacial position concurrently; achieving balanced design; understanding and anticipating the effects of physical stresses in structural situations.
P	Form Perception: the ability to perceive pertinent detail in objects or in pictoral or graphic material; the ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.	Consider: activities as inspecting surfaces for consistency in coloring, scratches, flaws, grain, texture; observing lint, dust, etc. on surfaces; determining if patterns are correct or match; recognizing small parts.
Q	Clerical Perception: the ability to perceive pertinent detail in verbal or tabular material; the ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in computation; a measure of speed of perception which is required in many jobs even when the job does not have verbal or numerical content.	Consider: work orders, specifications, dials, gages, and measuring devices which must be read; whether perceptual errors in reading words and numbers or in rapidly comparing similar forms or shapes would result in defective work.
K	Motor Coordination: the ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed; the ability to make a movement response accurately and swiftly.	Consider: motor coordination involves hand movements guided by concentrated visual attention; objects are guided into position or parts are assembled.
F	Finger Dexterity: the ability to move the fingers, and manipulate small objects with the fingers, rapidly or accurately.	Consider: bolts and screws are handled; small tools, machine controls, are manipulated; musical instruments are played; fine adjustments and alignments are made to instruments and machines.

RATINGS ESTIMATE SHEET

Definitions

APTITUDES

	Definitions of Aptitudes	Interpretive Information
M	Manual Dexterity: the ability to move the hands easily and skillfully; the ability to work with the hands in placing and turning motions.	Consider: working with arms and hands; objects are moved or stacked by hand or in other situations in which wrists and hands are used in turning and placing movements.
E	Eye-Hand-Foot Coordination: the ability to move the hand and foot coordinately with each other in accordance with visual stimuli.	Consider: involves using eyes, hands, and feet coordinately; unless there is definite coordination of hand and foot movements with what the eye sees, this aptitude is not present.
C	Color Discrimination: the ability to match or discriminate between colors in terms of hue, saturation, brilliance; the ability to identify a particular color or color combination from memory and to perceiving contrasting color combinations.	Consider: identification of differences and similarities in colors from memory; using a visual standard against which colors can be matched or identified; or reproduction of colors using knowledge of color combinations.

RATING ESTIMATE SHEET

INTERESTS

An interest is a liking or a preference for an activity. Numerous studies have indicated a significant correlation between job stability and satisfaction, and positive interest in the type of task being learned.

The 12 interest factors used by the U.S. Employment Service are used here.

Procedures

Estimating Interests: Select the interest factors that apply to the lab, based on a careful evaluation of the applicability of each factor to a significant aspect of the lab. One or more of these interest factors can be applied to a lab. Assign a primary interest and, if applicable, up to two additional interests.

RATINGS ESTIMATE SHEET

Definitions

INTERESTS

01 Artistic: interest in creative expression of feelings or ideas.

02 Scientific: interest in discovering, collecting, and analyzing information about the natural world and applying scientific research findings to problems in medicine, life sciences, and the natural sciences.

03 Plants and Animals: interest in activities involving plants and animals, usually in an outdoor setting.

04 Protective: interest in the use of authority to protect people and property.

05 Mechanical: interest in applying mechanical principles to practical situations, using machines, handtools, or techniques.

06 Industrial: interest in repetitive, concrete, organized activities in a factory setting.

07 Business Detail: interest in organized, clearly defined activities requiring accuracy and attention to detail, primarily in an office setting.

08 Selling: interest in bringing others to a point of view through personal persuasion, using sales and promotional techniques.

09 Accommodating: interest in catering to the wishes and needs of others, usually on a one-to-one basis.

10 Humanitarian: interest in helping others with their mental, spiritual, social, physical, or vocational concerns.

11 Leading-Influencing: interest in leading and influencing others through activities involving high-level verbal or numerical abilities.

12 Physical Performing: interest in physical activities performed before an audience.

RATINGS ESTIMATE SHEET

TEMPERAMENTS

Temperaments are the adaptability requirements made on the student by specific types of tasks in a lab. It has been found that different task/lab situations call for different personality traits on the part of the student. The degree to which a student can adapt to a lab situation, is often a determining factor in success. A student's dissatisfaction or failure to perform adequately can sometimes be attributed to adapt to a lab situation rather than to an inability to learn or carry out lab duties.

Unlike aptitudes and interests, there is currently no validated instrument for measuring whether students possess a specific temperament. For this reason, temperament factors are not here recommended for use in training selection. They do, though, provide an extra dimension for identifying task relationships, restructuring tasks within a lab, and providing counseling services.

The 11 temperaments identified by the U.S. Employment Service are used here.

Procedure:

Estimating Temperaments: Evaluate the lab activities for applicability to the temperament factors as stated in the definitions of temperaments on pages 26, 27 and 28 of Part 4. Select those factors considered to be important in relation to the kinds of adjustments which the student must make for successful performance within the lab. Some simple tasks may require the student to adjust to only one temperament factor while others may require adjustment to several.

RATINGS ESTIMATE SHEET

Definitions

TEMPERAMENTS

D Directing: (Controlling, and/or Planning Activities of Others): involves accepting responsibility for formulating plans, designs, practices, policies, methods, regulations, and procedures for operations or projects; negotiating with individuals or groups for agreements or contracts; and supervising subordinate workers to implement plans and control activities.

R Repetitive: (Performing Repetitive and/or Short-Cycle Work): involves performing a few routine and uninvolved tasks over and over again according to set procedures, sequence, or pace with little opportunity for diversion or interruption. Interaction with people is included when it is routine, continual, or prescribed.

I Influencing: (Influencing People in their Opinions, Attitudes and Judgments): involves writing, demonstrating, or speaking to persuade and motivate people to change their attitudes or opinions; participate in a particular activity; or purchase a specific commodity or service.

V Variety: (Performing a Variety of Duties): involves frequent changes of tasks involving different aptitudes, technologies, techniques, procedures, working conditions, physical demands, or degrees of attentiveness without loss of efficiency or composure. The involvement of the student in two or more tech concentrations may be a clue that this temperament is required.

E Expressing: (Personal Feelings): involving creativity and self expression in interpreting feelings, ideas, or facts in terms of a personal viewpoint; treating a subject imaginatively rather than literally; reflecting original ideas or feelings in writing, painting, composing, sculping, decorating, or inventing; or interpreting works of others by arranging, conducting, playing musical instruments, choreographing, acting, directing, critiquing, or editorializing.

A Alone: (Working Alone or Apart in Physical Isolation from Others): involves working in an environment that regularly precludes face-to-face interpersonal relationships for extended periods of time due to distances of physical barriers involved.

S Stress: (Performing Effectively Under Stress): involves coping with circumstances dangerous to the student or others.

T Tolerances: (Attaining Precise Set Limits, Tolerances, and Standards): involves adhering to and achieving exact levels of performance, using precision measuring instruments, tools, and machines to attain precise dimensions; preparing exact verbal and numerical records; and complying with precise instruments and specifications for materials, methods, procedures, and techniques to attain specified standards.

RATINGS ESTIMATE SHEET

Definitions

TEMPERAMENTS

U Under: (Wording Under Specific Instructions): involves continuously following instructions in oral, written, or diagrammatic form, which precludes independent action or judgment in working out lab problems.

P People: (Dealing with People): involves interpersonal relationships in lab situations beyond receiving instructions.

J Judgments: (Making Judgments and Decisions): involves solving problems, making evaluations, or reaching conclusions based on subjective or objective criteria (senses, knowledge, experiences, quantifiable or factual data).